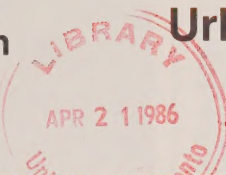


## Land Use Change in Canada



## Urbanization of Rural Land in Canada

Lands Directorate

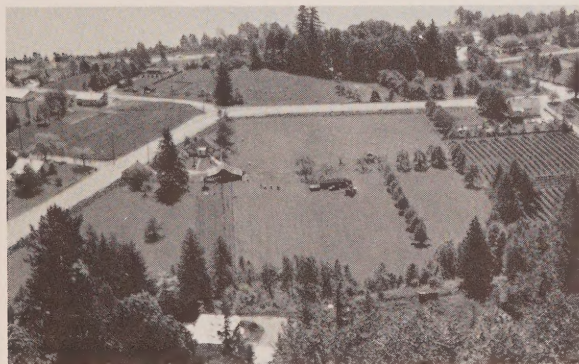
Fact Sheet 85-4

### Urbanization

Prime renewable resource lands constitute a major source of land for urbanization. New data produced by the Canada Land Use Monitoring Program of the Lands Directorate, Environment Canada, indicate that approximately 50% of the rural land converted to urban uses in 70 Urban-Centred Regions (UCRs) across Canada had high capability for agricultural production.

This fact sheet focuses on the loss of rural land to urban activities in the 70 UCRs for the period 1976 to 1981. Urban activities are those uses of land which remove the potential for renewable-resource use by the construction of buildings and urban infrastructure. Areas that have been isolated by urbanization and are no longer viable for renewable resource purposes are also included.

Special emphasis is placed on the loss of high capability agricultural land, identified as Classes 1, 2 and 3 agricultural land by the Canada Land Inventory (CLI). Application of the Agroclimatic Resource Index (ACRI) indicates that the conversion of these prime lands is nationally significant in its potential impact on food production.



### Highlights

- Approximately 98 976 hectares (ha) of rural land were converted to urban uses between 1976 and 1981.
- Prime agricultural land (CLI Classes 1-3) accounted for 50% or 49 593 ha of the total land converted.
- The population of the UCRs increased by about 6%, while conversion of rural land for urban uses increased by nearly 11% during the 1976-1981 period.
- The nine UCRs with the largest populations (> 500 000) accounted for 37% of the total rural land converted, although 72% of the population increase occurred in these centres. Smaller centres (< 50 000 population) urbanized more land per capita.
- The 14 largest UCRs by area (> 20 000 ha) had the smallest overall expansion in area (8%), but sustained 78% of the population increase.
- These 14 large UCRs by area converted rural land at a rate of 76 ha per 1 000 increase in population. In contrast, the corresponding rate for centres occupying a small area (< 4 000 ha) was 314 ha per 1 000 population increase.
- Replacing the productive value of the prime agricultural land lost with new agricultural land on the margins would require over twice the amount of the land converted, based on ACRI calculations.



## National Overview

### *Conversion of Rural Land to Urban Uses*

Nearly 16 million Canadians live within UCRs that are in close proximity to some of the nation's best lands for renewable-resource production. The juxtaposition of high population density and inherently valuable lands results in serious conflicts in land use, exemplified by the irretrievable loss of high quality farmland, forest land, and special wildlife habitat.

The distribution of the 70 UCRs examined for their conversion of rural land to urban uses between 1976 and 1981 was as follows: 7 in the Atlantic provinces, 19 in Quebec, 26 in Ontario, 11 in the Prairie provinces, and 7 in British Columbia. The actual built-up area of these UCRs occupied 1 031 086 ha in 1981. This area exceeds the total land mass of Prince Edward Island (565 656 ha) by 82%.

An estimated 98 976 ha of rural land were converted to urban uses during the 1976-1981 period. This area is equivalent to creating a city the size of Toronto. The total urban area growth (11%) represents a 59% increase in area over the 1971-1976 period.

The 7 UCRs of British Columbia and Ontario's 26 UCRs together accounted for approximately half of the total rural land converted (see Figure 1). British Columbia's UCRs grew by an average of 17%, at a rate of 4 674 ha per year, while Ontario's larger number of UCRs grew by 8% at an annual rate of 5 415 ha. Quebec's 19 UCRs grew by 10%, at an annual rate of 3 522 ha.

### *Population Change and Rural to Urban Land Conversion*

The 1981 population of the 70 UCRs was 15 610 106, or about 64% of the total Canadian population of 24 343 181



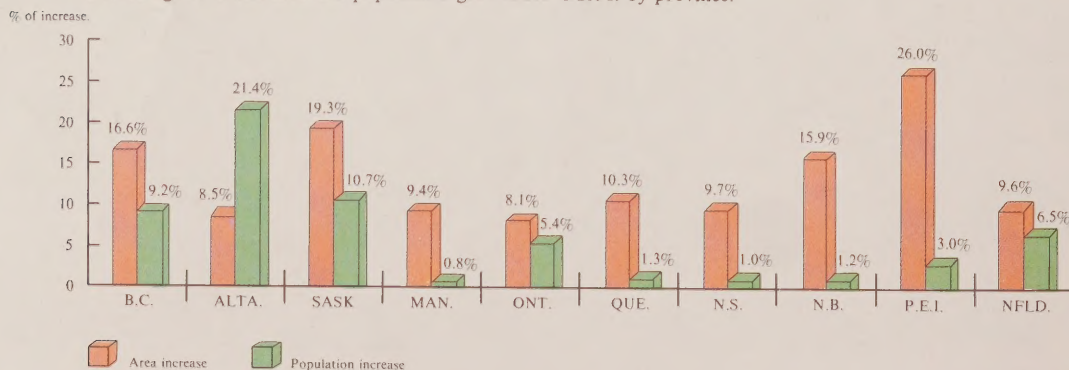
(Statistics Canada, 1981). The overall population density of these centres was approximately 15 persons/ha, compared to the nation's population density of 0.3 persons/ha.

Urban population increases were most dramatic in Alberta, with a 21% increase, or 29% of the UCR total for the 1976-1981 period. Ontario's urban population grew by 5%, representing 41% of the UCR total. Quebec, Nova Scotia, New Brunswick and Manitoba each had urban population increases of less than 3%, the smallest increase being Manitoba's 1%.

Calgary and Edmonton had the greatest percentage increase in their urban populations at 26% and 17% respec-

**FIGURE 1**

Percentage of urban area and population growth for UCR's: by province.



tively. While these population increases were substantially greater than the national average of 6%, their urban areas expanded at a rate well below the 11% national average. Only Windsor in Ontario experienced a population decline and yet continued to expand in built-up area by approximately 9%.

Rural to urban land conversion can be related to population change by measuring the number of hectares of rural land converted per 1 000 increase in urban population. High rates indicate that large areas of rural land are being urbanized by a relatively small increase in population, suggesting low density use of the land.

The Maritime provinces had the highest rates of rural to urban land conversion if population growth is taken into account. New Brunswick's rate of 1 657 ha per 1 000 population growth is the highest in the nation, followed by Prince Edward Island (1 580 ha), Nova Scotia (1 193 ha), Manitoba (791 ha), and Quebec (334 ha). Ontario's rate of conversion of 80 ha per 1 000 increase in population was the second lowest, after Alberta's rate of 46 ha.

There is an inverse relationship between the size of the UCR and the rate of rural land conversion per 1 000 increase in urban population (see Figure 2). The largest UCRs (>500 000 population) have a lower conversion rate than the smaller UCRs groups. These larger centres have the greatest population density of 19 persons/ha; and were responsible for 72% of the population increase, and 37% of the total rural land converted. The area of these large UCRs, however, increased by only 7% and they absorbed only 61 ha of rural land for each 1 000 increase in urban population.

In contrast, UCRs with populations of 25 000–50 000 absorbed an average of 341 ha of rural land per 1 000 increase in urban population. These UCRs had an average population density of 8 persons/ha and were responsible for 24% of the total rural land converted.



### *Agricultural capability*

From a land use viewpoint, one of the most significant aspects of rural to urban land conversion is the loss of productive renewable-resource lands. Land that has been urbanized will predictably not be returned to such resource uses as agriculture or forestry.

The CLI shows that of the approximate 250 million ha surveyed for renewable resource use, 45.9 million ha are crop-producing lands (Classes 1-3), of which 4.2 million ha are best suited for agriculture (Class 1) (Simpson-Lewis *et al.*, 1979). Soils in Classes 1-3 have a high capability for sustained cultivation of field crops.

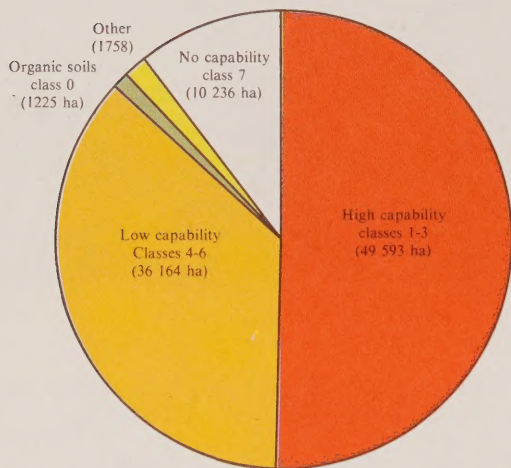
The distribution of prime agricultural lands varies across Canada. Approximately 50% of all Class 1 land, or 2.1 million ha, is found in Ontario, principally in the southern portion of the province where conflict with urbanization occurs. Another 44% of the Class 1 land is found in Saskatchewan and Alberta. No Class 1 agricultural capability land is located in the Atlantic provinces.

**FIGURE 2**  
**Growth and change within UCRs grouped by population, 1976–1981**

Urban Area population class (No. of UCRs)	Urban Area increase	Population increase	Rate of land conversion
	%	%	Ha/1 000 Change in Population
25 000–50 000 (29)	24.2	7.4	341
50 001–100 000 (17)	18.2	4.4	367
100 001–250 000 (12)	11.7	4.3	202
250 001–500 000 (3)	7.2	3.8	159
> 500 000 (9)	7.0	6.0	61
Average for 70 UCR's	10.6	5.6	119

**FIGURE 3**

Agriculture capability of rural land converted to urban uses: 1976-1981



Approximately 50% (49 593 ha) of rural land urbanized between 1976 and 1981 had high capability for agriculture (see Figure 3). This is a significant decline in comparison to 61% for the 1971-1976 period, and 63% for the 1966-1971 period. Within UCRs there tends to be a disproportionately high use of good agricultural land (Classes 1-3) for urban land uses. The comparison of the availability of good quality land to its selection for urban uses aggregated to the provincial level is shown in Figure 4. The proportion of good quality agricultural land used for urban purposes in UCRs is greater than its percentage occurrence in all provinces. Manitoba and Ontario are the two provinces where this difference is greatest.

There is a close relationship between the location of urban areas and good quality agricultural lands. More than 55% of Canada's Classes 1-3 agricultural capability land lies within a 160 km radius of Census Metropolitan Areas (Neimanis, 1979). This prime agricultural land is under tremendous urbanization pressure.

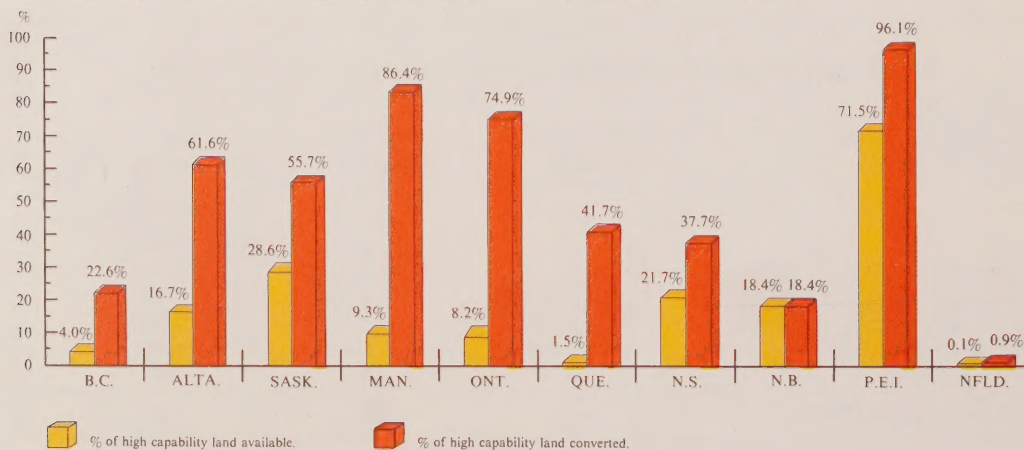
Approximately 10% of Canada's prime agricultural land and about 38% of all Class 1 lands are in the areas around Toronto and Montreal. Twenty-six percent of all lands urbanized and 34% of all prime agricultural land converted occurred adjacent to these two urban areas.



In Ontario, 40% of all prime agricultural land is located within a 160 km radius of Toronto. The eleven UCRs situated within this radius converted 13 328 ha of rural land between 1976 and 1981. Eighty-three percent of this rural land had prime agricultural capability; 56% was Class 1. This rural to urban conversion equals 4% of the total Class 1 agricultural land in the province.

**FIGURE 4**

Availability and selection of high capability agricultural land for urban uses: 1976-1981.



Population in this Toronto radius increased by about 7% representing about 34% of Canada's increase in urban population between 1976 and 1981. For every 1 000 increase in urban population, 46 ha of rural land were absorbed. Annually, 2 211 ha of high capability land were converted directly into urban uses.

About 72% of Quebec's 2.2 million ha of prime lands are located within a 160 km radius of Montreal. Thirteen UCRs are situated within this Montreal radius. Collectively, these centres have grown in area by 9% since 1976, converting 5 654 ha of prime agricultural land to urban uses or 45% of the total 12 596 ha urbanized. For each 1 000 increase in population in this radius around Montreal, 427 ha of rural lands were converted, 191 ha of which were prime agricultural land. Annually, 1 131 ha of high capability agricultural land changed to urban uses.



#### *Replacement Value of Converted Prime Agricultural Lands*

Much of Canada's best agricultural land is under sustained pressure for urban development. Competition for farmland is particularly acute in regions such as southwestern Ontario. The question is, can agricultural production lost from these prime lands be replaced by opening up new agricultural lands in more remote areas such as the Peace River region in Western Canada?

The CLI agricultural capability system can provide an evaluation of agricultural land based on soils, but does not adequately reflect the effects of climate on agricultural production. However, using the CLI system as a base, an agroclimatic resource index (ACRI) can be used to determine areas most valuable for agricultural production from a climate perspective. ACRI considers the length of the frost-free period, while also taking into account significant moisture shortages and inadequate summer heat. ACRI values range from 3.0 (most suitable) found in southwestern Ontario, to less than 1.0 found in northern areas.



Provincial ACRI values range from 1.2 for Newfoundland and 1.4 for British Columbia to 2.0 for Quebec and 2.4 for Ontario (see Figure 5). Saskatchewan and Alberta together have 61% of Canada's prime agriculture lands with ACRI values of 1.4 and 1.5 respectively. Less than 15% of all Canada's farmland is in districts with ACRI values of 2.0 or higher. These lands are principally in Ontario and Quebec and face the greatest threat from the conversion of rural lands to urban uses.

It should be recognized that wide variations of ACRI values can occur within a province. For example, in Ontario, although the overall provincial ACRI is 2.4, ACRI values for individual UCRs range from 1.5 in Thunder Bay to 3.0 in Windsor.

Fifty percent of the rural land converted in UCR's to urban uses in Canada between 1976 and 1981 was CLI Classes 1-3 for agriculture, mostly with 2.0 ACRI ratings. To replace these prime agricultural lands would require approximately twice as much land, or 106 834 ha of Classes 1-3 land with an ACRI rating of 1. Replacement would have to occur on the margins





of present agricultural production areas where land of Classes 1-3 is available. Only three regions offer any long-term potential for new agricultural development: the Peace River District of northern Alberta and British Columbia; Ontario's northern clay belt; and scattered land in the Maritime Provinces.

The Peace River District in Alberta, for example, with an ACRI value of approximately 1, has an estimated 525 000 ha of prime agricultural land, but climatic factors limit the productivity of the land. Replacing the productive value of high capability land converted in Ontario and Quebec (approximately 27 622 ha) would require an estimated 68 827 ha of Peace River land (see Figure 5). Furthermore, not all crops can be grown with the Peace River region's shortened growing season.

Replacement of prime agricultural lands in urban centred regions by the development of new, lower quality agricultural areas can only be accomplished at substantially higher cost. Such costs relate to the restricted type of agricultural production, and increased land development, energy and transportation expenses per unit of food produced. Implications to other land uses, such as forestry and wildlife, must also be taken into account.

## The National Impact

Since urban centres will continue to grow, urban expansion should, where possible, be guided to sites less favourable for renewable resource use. This should be carried out in an organized manner which does not segment these areas into parcels which then become no longer economically viable.

During the 1976-1981 period, the 70 UCRs with populations of 25 000 or more absorbed 98 976 ha of rural land. About 51% of the total rural land converted to urban uses was in Ontario and British Columbia. The 15 most populous centres accounted for 42% of the land converted, and Toronto and Montreal together were responsible for almost 10%.

For each increase of 1 000 in the urban population, 119 ha were converted to urban use, at an annual conversion rate of 19 795 ha. The largest centres in population and area accounted for most of the land converted and population growth. The largest UCRs generally converted land at a lower rate per 1 000 increase in population.

Approximately 50% of the land converted in Canada was CLI Classes 1-3. The percentage varies for each province, ranging from 96% in Prince Edward Island to a low of 1% in Newfoundland, and often reflects the proportion of good quality land which occurs within the UCR. However, less productive land is often ignored in favour of more readily developed prime resource lands.

To replace the 49 593 ha of prime agricultural land lost in Canada between 1976 and 1981 would require 106 834 ha with the same soil capabilities in the Peace River District because of less favourable climatic conditions. Alternative prime agricultural lands with a more favourable climate may be available for replacement, such as those lands held in speculation or not fully utilized at present. It is expected however, that the major replacement of lost agricultural lands

**FIGURE 5**  
**Replacement of converted UCR high capability agricultural lands with Peace River land**

Province (No. of UCRs)	Converted classes 1-3 Lands (ha)	Provincial ACRI value	Land required in Peace River area* (ha)
British Columbia (7)	5 272	1.4	10 442
Alberta (5)	6 821	1.5	10 795
Saskatchewan (4)	2 509	1.4	3 591
Manitoba (2)	3 433	1.9	6 482
Ontario (26)	20 276	2.4	51 952
Quebec (19)	7 346	2.0	16 875
New Brunswick (3)	892	1.7	1 534
Nova Scotia (2)	1 481	1.7	2 518
Prince Edward Is. (1)	1 463	1.8	2 633
Newfoundland (1)	10	1.4	12
<b>Totals</b>	<b>49 503</b>		<b>106 834</b>

\*Individual UCR ACRI values were used to obtain provincial estimate of replacement agricultural land.

will probably take place in marginal areas. Not only will this entail the expense of clearing new lands and limit the types of crops grown, but investment in transportation and marketing networks will also be necessary. More intensified use of existing prime land is another alternative, but this approach increases the risk of land degradation and higher costs of production.

Prime lands provide employment and food and contribute to the balance of payments through exports. Loss of prime lands in urban areas where alternate lands of lower capability are available for urban purposes is thus of national consequence and concern.

## Methodology

The rural to urban land-use conversion statistics for this fact sheet are derived from the urban-centred regions component of the Canada Land Use Monitoring Program.

Approximately 6 million ha in 70 UCRs have been identified for study. UCRs are defined as rural-urban areas with populations of 25 000 or more using 1981 Census of Canada statistics. UCR boundaries are based primarily on Census Metropolitan Areas and Census Agglomerations. Minor boundary modifications have been made to exclude areas where topographic features prohibit potential settlement.

Data sources included black and white air photographs, selective field checking, CLI agricultural capability maps, 1976 land use maps as well as previous rural to urban land conversion studies. Information from interpreted air photography was transferred to 1:50 000 scale base maps. The 1981 and 1976 land use maps were then overlain and areas of change

calculated using a digitizing instrument. Changes involving CLI agricultural capability were calculated using a similar procedure. The actual date of the air photography ranged from 1980 to 1982 for the various UCRs, so it was necessary to prorate the results to 1981 to facilitate comparison, permit aggregation of the data, and permit correlation between area and population statistics (Warren and Rump, 1981).

The methodology was designed to suit the purposes of this study. This fact sheet provides nation-wide estimates of the amount, distribution, and significance of rural lands converted to urban uses between 1976 and 1981. The statistics derived for rural to urban land conversion should not be considered absolute particularly at the individual UCR level. Further land-use change data is presently being obtained for the 1981-1986 period.

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## Canada Land Use Monitoring Program

The Canada Land Use Monitoring Program (CLUMP) was established in 1978 by the Lands Directorate of Environment Canada to provide researchers, planners, managers and the public with an information base on land-use change. Designed to monitor, both spatially and sequentially, land use and land-use change in various component areas of Canada, CLUMP:

- provides improved awareness of the land resource;
- identifies land-use trends of national and regional importance;
- determines major areas of rapid change which have the potential to create land-use problems;
- analyses land-use change in terms of causes and consequences, particularly with respect to the impact of government policies and programs.

Four major components have been identified for monitoring the diverse forms of land-use change in Canada: urban-centred regions, prime resource lands, rural areas, and wildlands.

The urban-centred region component examines land use in the rural-urban fringe of urban centres with populations of over 25 000. In addition, to this fact sheet, others will document land-use change for the larger UCRs.

## For Further Information

Fact Sheets and further information on the Canada Land Use Monitoring Program may be obtained from Lands Directorate regional offices in Halifax, Quebec City, Burlington, Regina, and Vancouver or from the address below.

Lands Directorate  
Environment Canada  
Ottawa, Ontario  
K1A 0E7

## Pour de plus amples renseignements

Pour obtenir copie des feuillets d'information ou tout autre renseignement sur le Programme de surveillance de l'utilisation des terres au Canada, s'adresser à l'un des bureaux régionaux de la Direction générale des terres, à Halifax, Québec, Burlington, Regina ou Vancouver ou à la :

Direction générale des terres  
Environnement Canada  
Ottawa, Ontario  
K1A 0E7



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